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(54) A PROCESS FOR STABILIZING THE pH OF A PULP SUSPENSION AND FOR PRODUCING PAPER FROM THE STABILIZED PULP

VERFAHREN ZUR STABILISIERUNG DES pHS EINER ZELLSTOFFAUFSCHEIDUNG UND ZUR
PAPIERHERSTELLUNG

PROCEDE SERVANT A STABILISER LE pH D'UNE SUSPENSION DE PATE A PAPIER ET A
FABRIQUER DU PAPIER A PARTIR DE CETTE PATE A PAPIER STABILISEE

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(56) References cited:
EP-A- 0 281 273 GB-A- 815 247
US-A- 5 378 322

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- 5TH INTERNATIONAL CONFERENCE ON NEW
AVAILABLE TECHNIQUE, THE WORLD PULP
AND PAPER WEEK, 4-7 June 1996, Stockholm,
OSTBERG G.M.K. et al., "Use of Carbon Dioxide
in the Production of Sulfate (Kraft) Pulp", pages
508-515.

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Description

[0001] The invention relates to a process for stabilizing the pH of a paper making pulp suspension with buffering agents and to a process for producing paper from such a stabilized pulp suspension.

5 [0002] During the last ten to fifteen years many paper makers have converted their processes from acidic to neutral pH for a number of reasons, e.g. to gain increased strength and to be able to use calcium carbonate, CaCO₃, as a filler. The expression "neutral pH" corresponds in these processes to a pH in the short circulation of approximately 7-8,5, most preferably 7-8. This applies to paper produced from chemical, mechanical and recycled pulp, bleached or unbleached.

10 [0003] If the paper making pulp is acidic when entering the stock preparation and the short circulation is run at a neutral or alkaline pH, the traditional way of raising and controlling the pH is to add sodium hydroxide, NaOH. NaOH is, however, a very strong base, which means that only small amounts are needed for pH adjustments. Any over-dosage will cause a too big pH increase, which means that it is difficult to perform the pH adjustment in a controlled way. This is due to the low inherent buffering ability of a pulp suspension. The paper maker could end up in a situation with varying pH of the entering pulp, which has a negative impact on paper quality and paper machine runnability.

15 [0004] Through the stock preparation and the short circulation a number of paper chemicals and dilution waters are added, some of which are acidic and therefore decrease the pH of the pulp. The paper maker could therefore end up with a too low pH in the short circulation and would be once again forced to pH adjust using NaOH. The pH may also change at refining or in storage towers.

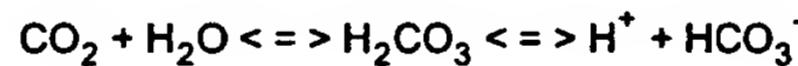
20 [0005] If the paper making pulp is alkaline instead when entering the stock preparation and if the short circulation is run at a neutral or alkaline pH, there is naturally no need to use any NaOH for pH control. The paper maker must however make sure that the pH is high enough to avoid ending up with too low a pH after addition of acidic paper chemicals.

25 [0006] In the prior art one way of avoiding ending up with too low pH values has been to add dissolved sodium bicarbonate, NaHCO₃, to the pulp. The NaHCO₃ dissociates in the pulp suspension forming bicarbonate ions, HCO₃⁻, which have a buffering effect and therefore counteract any pH decrease. NaHCO₃ is a solid powder, which is generally supplied in so called big-bags, and the paper mill needs space for handling, equipment for dissolving and tanks for storage. The NaHCO₃ is messy to work with, when in contact with moisture or water.

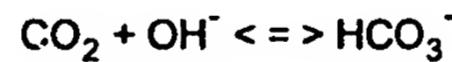
30 [0007] In a chlorine dioxide bleaching stage described in GB-A-815,247 the reaction is buffered with NaHCO₃ against a pH fall caused by the formation of acidic substances during the bleach. The NaHCO₃ may be added as such or it may be formed *in situ* by passing CO₂ into a slurry containing NaOH or Na₂CO₃. The buffering action is consumed in the reaction.

35 [0008] In the non-acidic sizing of paper with alkylketene dimers bicarbonate ions have been used to catalyze the reaction between the alkylketene dimers and the cellulose. According to US-A-5,378,322 the bicarbonate ions may be generated by dissociation of carbon dioxide CO₂ in the aqueous pulp.

40 [0009] Carbon dioxide is a gas, which easily dissolves under alkaline conditions, e.g. in water or a pulp suspension forming carbonic acid and/or bicarbonate ions according to the reaction:



[0010] At a high pH, especially greater than 10, the predominant reaction is



45 [0011] In the recycling of gypsum-containing waste or broke paper the accumulation of calcium sulfate poses a problem since the solubilized calcium sulfate may precipitate and disturb the paper making process. According to US-A-5,262,006 this problem may be overcome by adding carbonate ions and/or bicarbonate ions to the aqueous pulp suspension and by adjusting the pH to an alkaline value to precipitate the calcium as calcium carbonate. The bicarbonate ions may be created *in situ* for example by first adding a suitable soluble metal hydroxide and then adding carbon dioxide. According to the Patent, the calcium carbonate generation from calcium sulfate with carbon dioxide requires a close control of the pH since carbon dioxide has the effect of lowering the pH so that there is a risk of the pH becoming too low for the carbonation process.

50 [0012] According to G. Östberg at the 5th International Conference on New Available Technique, The World Pulp and Paper Week, June 4-7, 1996, Stockholm, pp. 508-515, the inherent buffering capacity of carbon dioxide used in the washing of pulp has a beneficial influence on the fibers processed in a pulp mill.

55 [0013] Carbon dioxide has been used for the pH control of pulp suspensions also, for instance, in a process described

in EP-A-0 281 273, wherein gaseous carbon dioxide is introduced to adjust and maintain the pH at a value which is preferably between 7.0 and 5.5.

[0014] Thus, in the prior art carbon dioxide has been used to create bicarbonate ions for its catalyzing, carbonating or pH lowering effect. However, a paper maker also has the need to obtain a stable pH so that chemical additions and various processing steps do not cause an unwanted fluctuation of the pH.

[0015] An object of the present invention is thus to provide a pH stabilization of aqueous pulp suspensions.

[0016] Another object of the invention is to provide a paper making pulp suspension having an increased buffering ability, i.e. a resistance to pH change.

[0017] A further object of the invention is to provide a technically advantageous process for buffering a pulp suspension.

[0018] An object is also to provide a pulp suspension having a controlled pH which is maintained at a desired level.

[0019] An object of the invention is also to provide a process for producing paper from a pulp suspension having a stabilized pH.

[0020] The invention according to the present application is defined in the appended claims, the contents of which are included herein by reference.

[0021] Consequently, the present invention relates to a process for stabilizing the pH of a pulp suspension in the stock preparation of a paper machine by using carbon dioxide. The stabilization is provided by increasing the buffering ability of said paper making pulp suspension by adding thereto a combination of an alkali metal hydroxide feed and a carbon dioxide feed which feeds substantially counter each other's pH changing effect, said feeds being provided in an amount sufficient to achieve a significant buffering effect of said pulp suspension. The process includes adjusting the pH of said pulp suspension by addition of an excess of said hydroxide or said carbon dioxide. Thus, the pH is maintained at a desired level throughout the subsequent paper making.

[0022] The feeding of a hydroxide and carbon dioxide in substantially countering amounts increases the level of buffering or alkalinity forming ions in the suspension without actually affecting its pH. Increasing the buffering ability stabilizes the suspension against pH fluctuations caused by subsequent additions of acidic or basic fluids and provides a stable pH throughout the succeeding steps.

[0023] The buffering ability of the present invention is also termed "alkalinity" and it is a measurement of "acid resistance", i.e. the content of buffering ions in a liquid or pulp suspension, which counteracts pH decrease at addition of hydrogen ions, H⁺. One way of expressing alkalinity is the amount of HCO₃⁻ and CO₃²⁻ ions in grams per liter. When a combination of hydroxide and carbon dioxide is used according to the present invention, the buffering ability or alkalinity of the pulp suspension is raised, thus creating larger "acid resistance".

[0024] The hydroxide used according to the invention should preferably be added prior to the addition of the carbon dioxide to ensure that the carbon dioxide is added under alkaline conditions.

[0025] The "amount sufficient to achieve a significant buffering effect" should be taken as meaning an amount providing a substantial and recognizable buffering effect in the pulp suspension. The amount normally varies depending on the characteristics of the pulp and on the conditions of treatment. A person skilled in the art will be able to calculate the required amount based on his general knowledge or by simple tests made on the actual pulp suspension, as indicated, for example in Example 9 of this specification.

[0026] Typically the amount of NaOH in the buffering combination will be between about 0.5 and 5 kg NaOH/ton dry cellulose and the amount of carbon dioxide in said combination will be between about 0.5 and 5 kg CO₂/ton dry cellulose. A typical buffering combination would include about 2 to 3 kg of NaOH and CO₂ per ton of dry cellulose. It is within the scope of the present invention to use more or less than the above mentioned amounts of both components, but in general it will be uneconomical to use more than what is required for a desired buffering action.

[0027] It is clear that the excess of either NaOH or CO₂ which is additionally used for pH adjusting purposes may significantly exceed the above amounts which provide the buffering effect.

[0028] The buffering effect obtained by the addition of NaOH and CO₂ in this way corresponds to the one obtainable by an addition of dissolved NaHCO₃ but it has the advantage that the space consuming and messy handling of solid NaHCO₃ is avoided. Sodium hydroxide, on the other hand, is a chemical which is abundantly available in the paper mill since it is used for many other purposes. Carbon dioxide gas may be generated on site or may be bought as desired. Feeding of carbon dioxide into the suspension is technically clean and easy.

[0029] A further advantage resides in that the hydroxide and carbon dioxide used according to the present invention serves the dual purpose of increasing the buffering ability and of adjusting the pH. Thus, according to the preferred embodiment of the invention, the pH of said pulp suspension is increased by adding an excess of alkali metal hydroxide such as aqueous sodium hydroxide or decreased by adding an excess of carbon dioxide.

[0030] The carbon dioxide is preferably in gaseous form, although it may be added as an aqueous liquid by dissolving gaseous or solid carbon dioxide in water. The hydroxide and carbon dioxide may be combined prior to feeding to the pulp suspension although it is preferred to feed them directly into the pulp circulation system such as to a pipe leading to a stock preparation tank.

[0031] The pulp suspension is preferably buffered by said combination to a pH between about 7 and 9.

[0032] According to the preferred embodiment of the invention the buffering ability of the pulp suspension is increased by providing a substantially equal molar amount of alkali metal hydroxide and dissolved carbon dioxide, said amount being sufficient to provide a significant buffering effect at about pH 8.

5 [0033] The pulp suspension may be bleached or unbleached chemical or mechanical pulp although the preferred pulp is bleached chemical pulp.

[0034] Calcium carbonate may advantageously be used as a filler for the pulp, since the stabilized pH will ascertain that the filler remains in solid form in the suspension. A fluctuation of the pH down to 6 or 5.5, for instance due to an inflow of circulating white water at such a pH, might dissolve the carbonate filler. Such an undesirable effect will be effectively prevented by the buffering action of the present invention.

10 [0035] The present invention also relates to a process for producing paper, said process comprising the steps of

- providing a paper making pulp suspension in the stock preparation of a paper machine;
- increasing the buffering ability of said pulp suspension by adding thereto a combination of an alkali metal hydroxide feed and a carbon dioxide feed which feeds substantially counter each others pH changing effect, said feeds being provided in an amount sufficient to achieve a substantial buffering effect of said pulp suspension, and adjusting the pH of said pulp suspension by addition of an excess of said hydroxide or said carbon dioxide for maintaining the pH at a desired level throughout the subsequent paper making;
- optionally adjusting the pH of said pulp suspension to a desired value between 7 and 9 by adding an alkaline agent such as NaOH or an acidic agent such as CO₂;
- forming said pulp suspension into a web; and
- drying said web to form paper.

15 [0036] The production of paper according to the present invention is performed in a conventional way in all other respects except for the increase of the buffering ability of the pulp prior to the short circulation. Such paper making processes are well known in the art and it is not considered necessary to describe them here in any greater detail.

20 [0037] The invention will now be illustrated with a few examples.

Example 1

25 (Reference example)

30 [0038] In a partly integrated paper mill bales of fully bleached kraft market pulp are introduced into a pulp slusher. The pH in the slusher is adjusted with aqueous NaOH to a pH of approximately 11.

35 [0039] After slushing, paper making chemicals and dilution water having an acidic effect are added to the slushed pulp suspension. As a consequence of this, the pH of the pulp suspension decreases from pH 11 to about pH 6.5-6.8. This pH is too low for the short circulation, which is run at a pH level of 7-7.5. Thus, the pH is again adjusted by an addition of aqueous NaOH.

40 [0040] Because of the strong basic action of NaOH it is difficult to achieve an exact pH control in this way. Over-dosing leads to a too high pH.

Example 2

45 [0041] The process of Example 1 is changed in order to improve the situation, so that a combination of NaOH and CO₂ is added to the pulp slusher. The amount of NaOH added to the suspension is substantially increased compared to the process of Example 1. A countering amount of CO₂ is added to provide a pH of approximately pH 9.

50 [0042] After slushing, the same paper chemicals as in Example 1 are added to the slushed pulp suspension. Because of the buffering effect of the combined NaOH and CO₂, the acidic additions lower the pH only to pH 7.2. This is a suitable pH for the short circulation and there is no need for any pH control using NaOH.

Example 3

(Reference example)

55 [0043] In a paper mill a kraft pulp suspension having a pH of 5.1 is fed to a storage tower. Prior to the entry into the tower, the pH of the pulp suspension is adjusted to pH 8 by an addition of aqueous NaOH into the pipe leading to the tower. The pulp suspension is fed from the storage tower to a refiner. At refining the pH decreases to about pH 6.

[0044] The low pH causes problems in the subsequent sizing of the pulp.

Example 4

[0045] The process of Example 3 is repeated with the exception that instead of feeding only the required amount of NaOH into the pulp suspension, an excess of NaOH is fed first into the pipe followed by feeding gaseous CO₂ into the pipe counteracting the excess NaOH. The resulting suspension again has a pH of 8 when entering the storage tower.

[0046] From the storage tower the pulp is fed to the refiner. At refining the pH remains at about pH 8 and there are no problems at sizing.

Example 5

[0047] In a laboratory trial a pulp suspension having a pH of 5.1 was used. The pH of the pulp suspension was adjusted to pH 8 by using a) only NaOH and b) by using an excess of NaOH in combination with CO₂. The buffering effect of the suspension was tested with a strong acid (alum, pH 3.0).

[0048] The results are shown in Table 1 below.

Table 1

		pH ¹	NaOH (ml)	CO ₂ (g)	pH ²	alum (ml)	pH ³
a)	(NaOH)	5.1	2	-	8.0	1	6.4
b)	(NaOH + CO ₂)	5.1	3	1	8.0	1	7.9

¹ the pH of the initial pulp suspension

² the pH after addition of NaOH / NaOH + CO₂

³ the pH after addition of acid

[0049] In the above process 1 ml of the aqueous NaOH corresponds to about 2.5 kg/ton cellulose calculated on the dry weight basis; 1 g of CO₂ similarly corresponds to about 2.5 kg/ton cellulose; and 1 ml of alum corresponds to about 2.8 kg/ton cellulose.

[0050] The above results clearly show that the addition of countering amounts of NaOH and CO₂ stabilize the pH of the pulp suspension.

Example 6

(Reference example)

[0051] A pulp suspension was stored in a pulp storage tank in a pulp mill at a pH of 5.5 to 6. The pulp was fed at this pH at a consistency of 3 to 4% to the paper mill via a press which increased the consistency to about 10%. The pulp was fed at this consistency to the paper mill storage tank at a pH of 5.5 to 6.

[0052] White water from the paper machine was fed to the storage tank at a pH of 7.5 to 8. The paper was produced with CaCO₃ as filler. Some of the filler circulated with the white water to the storage tank. When entering the storage tank the CaCO₃ in the white water dissolved as it met the pulp suspension at pH 5.5 to 6.

[0053] The dissolving of the CaCO₃ caused loss of filler and in addition thereto the calcium ions increased the hardness of the water and caused precipitations at unwanted positions.

[0054] From the storage tank the suspension was fed to a refiner. For improving the refining the pH of the pulp suspension was adjusted to 7.5 with NaOH before the refiner. Careful control of the NaOH feed was required to avoid dosing too much or too little.

[0055] In the refiner the pH decreased to 6 to 6.5 which meant increased energy consumption at refining. The pH was too low for the sizing. Thus, the pH had to be adjusted again for the sizing.

Example 7

(Reference example)

[0056] The process of Example 6 was repeated with the exception that aqueous NaHCO₃ was fed to the paper mill storage tank to obtain the desired pH of about 7.5 to 8. The CaCO₃ in the white water was not dissolved and the problem with filler loss was resolved.

[0057] The pH of the feed to the refiner was about 7.5 and no NaOH was fed to the suspension. However, in the refiner the pH decreased as before and a pH adjustment with NaOH was required for sizing.

Example 8

[0058] The process of Example 6 was repeated with the exception that NaOH and CO₂ were fed to the pipe leading to the paper mill storage tank. The pH was adjusted to 8 and no loss of filler occurred in the storage tank.

[0059] The pH of the feed to the refiner was about 8 and no NaOH was fed to the suspension. At refining the buffering ability of the suspension counteracted the pH lowering effect in a sufficient degree to retain the pH at 7.5 to 8.

[0060] There was no need for a pH adjustment for sizing. The pulp was used for the production of paper with an excellent result.

Example 9

[0061] A pulp suspension having a 10% consistency and a pH of 7.4 was divided into two lots, Pulp 1 and Pulp 2, respectively, weighing 2030 g each. The pH of the pulp suspension was adjusted on one hand with sulfuric acid (a 10% by weight aqueous solution of H₂SO₄) and on the other hand with gaseous carbon dioxide and a combination of 1 M sodium hydroxide and carbon dioxide gas.

[0062] The pH of Pulp 1 was adjusted to 6.2 with said sulfuric acid. The pH of Pulp 2 was adjusted to 6.2 by adding 15 ml sodium hydroxide and 1.02 g of carbon dioxide. The resulting pulp suspensions were titrated with 10% sulfuric acid to study their respective resistance to pH change.

[0063] The results are indicated in Table 2 below.

Table 2

Titration H ₂ SO ₄ (kg/t)	pH Pulp 1	pH Pulp 2
0	6.22	6.20
1.4	6.18	6.20
2.4	6.10	6.21
4.7	6.03	6.17
10.6	5.82	6.12

[0064] The sulfuric acid in Table 2 is indicated in kg of 100% H₂SO₄ per ton of dry cellulose.

[0065] For the above adjustment of the pH and buffering of Pulp 2, NaOH was added in an amount of 2.9 kg/ton cellulose and CO₂ was used in an amount of 5.1 kg/ton cellulose. The CO₂ was used both for pH adjustment and to counter the addition of sodium hydroxide.

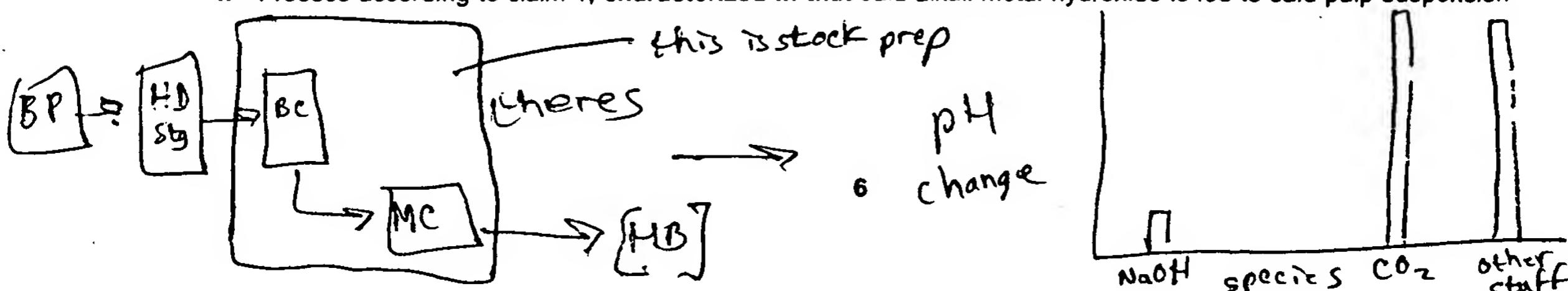
[0066] The test shows that fairly small amounts of a combination of sodium hydroxide and carbon dioxide provides an effective buffering action. The above final pH of 6.12 would render Pulp 2 fully useful for papermaking purposes, while the final pH of Pulp 1 would be too low.

[0067] It is evident that the invention may be varied in a great number of ways which are obvious to those skilled in the art without deviating from the scope of the claims.

Claims

Sundar says nobody adding NaOH in stock except as a small portion of additives fed to stock prep

1. A process for stabilizing the pH of a pulp suspension in the stock preparation of a paper machine by using carbon dioxide, characterized by increasing the buffering ability of said paper making pulp suspension by adding thereto a combination of an alkali metal hydroxide feed and a carbon dioxide feed which feeds substantially counter each other's pH changing effect, said feeds being provided in an amount sufficient to achieve a significant buffering effect of said pulp suspension, and adjusting the pH of said pulp suspension by addition of an excess of said hydroxide or said carbon dioxide for maintaining the pH at a desired level throughout the subsequent paper making.
2. Process according to claim 1, characterized in that the pH of said pulp suspension is adjusted to a pH between about 7 and 9 by adding an excess of said alkali metal hydroxide or by adding an excess of said carbon dioxide.
3. Process according to claim 1, characterized in that said alkali metal hydroxide is aqueous sodium hydroxide and said carbon dioxide is gaseous carbon dioxide.
4. Process according to claim 1, characterized in that said alkali metal hydroxide is fed to said pulp suspension



prior to the feeding of said carbon dioxide.

5. Process according to claim 1, characterized in that the buffering ability of said pulp suspension is increased by providing a substantially equal molar amount of alkali metal hydroxide and dissolved carbon dioxide, said amount being sufficient to provide a significant buffering effect at about pH 8.

6. Process according to claim 1, characterized in that said pulp suspension is chemical or mechanical pulp.

10 7. Process according to claim 6, characterized in that said pulp suspension is bleached chemical pulp.

10 8. Process according to claim 1, characterized in that said pulp suspension contains and/or is intended to contain calcium carbonate filler.

15 9. Process according to claim 1, characterized in that said alkali metal hydroxide and carbon dioxide feeds are added to said pulp suspension flowing in a pipe leading to a stock preparation tank.

10 10. Process according to claim 1, characterized in that said alkali metal hydroxide and said carbon dioxide are combined prior to feeding to the pulp suspension.

20 11. A process for producing paper comprising

- providing a paper making pulp suspension in the stock preparation of a paper machine;
- increasing the buffering ability of said pulp suspension by adding thereto a combination of an alkali metal hydroxide feed and a carbon dioxide feed which feeds substantially counter each others pH changing effect, said feeds being provided in an amount sufficient to achieve a substantial buffering effect of said pulp suspension, and adjusting the pH of said pulp suspension by addition of an excess of said hydroxide or said carbon dioxide for maintaining the pH at a desired level throughout the subsequent paper making;
- forming said pulp suspension into a web; and
- drying said web to form paper.

30 12. Process according to claim 14, characterized in that the pH of said pulp suspension is adjusted to a desired value between 7 and 9 by adding an excess of said alkali metal hydroxide or said carbon dioxide.

35 Patentansprüche

1. Verfahren zur Stabilisierung des pH in einer Pulpesuspension bei der Stoffaufbereitung für eine Papiermaschine unter Verwendung von Kohlendioxid, dadurch gekennzeichnet, daß das Puffervermögen der Pulpesuspension für die Papierherstellung erhöht wird, indem eine Kombination eines Zustroms eines Alkalimetallhydroxids und eines Zustroms von Kohlendioxid zugegeben wird, wobei die Zuströme sich in ihrer Wirkung auf die Änderung des pH im wesentlichen ausgleichen, wobei die Zuströme in einer Menge vorgesehen sind, die ausreichend ist, um eine deutliche Pufferwirkung in der Pulpesuspension zu bewirken, und der pH der Pulpesuspension eingestellt wird durch Zugabe eines Überschusses an Hydroxid oder Kohlendioxid, um den pH auf einem bestimmten Wert während der nachfolgenden Papierherstellung zu halten.

45 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß der pH der Pulpesuspension auf einen pH zwischen ungefähr 7 und 9 eingestellt wird, indem ein Überschuß des Alkalimetallhydroxids oder ein Überschuß des Kohlendioxids zugegeben wird.

50 3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Alkalimetallhydroxid wässriges Natriumhydroxid ist und das Kohlendioxid gasförmiges Kohlendioxid ist.

4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Alkalimetallhydroxid der Pulpesuspension vor der Zugabe des Kohlendioxids zugeführt wird.

55 5. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Puffervermögen der Pulpesuspension erhöht wird, indem eine im wesentlichen äquimolare Menge an Alkalimetallhydroxid und an gelöstem Kohlendioxid zur Verfügung gestellt wird und die Menge ausreichend ist, um eine deutliche Pufferwirkung bei ungefähr pH 8 zu bewirken.

6. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Pulpesuspension eine chemische oder eine mechanische Pulpe ist.
7. Verfahren nach Anspruch 6, dadurch gekennzeichnet, daß die Pulpesuspension eine gebleichte chemische Pulpe ist.
- 5 8. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Pulpesuspension Calciumcarbonat als Füllstoff enthält und/oder dazu vorgesehen ist, dieses zu enthalten.
- 10 9. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Zuströme des Alkalimetallhydroxids und des Kohlendioxids der Pulpesuspension zugefügt werden, die in einer zu einem Stoffaufbereitungstank führenden Leitung strömt.
- 15 10. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das Alkalimetallhydroxid und das Kohlendioxid vor der Zugabe zur Pulpesuspension kombiniert werden.
11. Verfahren zur Herstellung von Papier, umfassend die Schritte
 - 20 - Bereitstellen einer Pulpesuspension für die Papierherstellung bei der Stoffaufbereitung für eine Papiermaschine;
 - Erhöhen des Puffervermögens der Pulpesuspension durch Zugabe einer Kombination eines Zustroms von Alkalimetallhydroxid und eines Zustroms von Kohlendioxid, wobei sich die Zuströme in ihrer Wirkung auf die Änderung des pH annähernd ausgleichen, wobei die Zuströme in einer Menge vorgesehen werden, die ausreichend ist, um eine deutliche Pufferwirkung in der Pulpesuspension zu bewirken, und Einstellen des pH der Pulpesuspension durch Zusatz eines Überschusses des Hydroxids oder des Kohlendioxids zum Halten des pH auf einem bestimmten Wert während der nachfolgenden Papierherstellung;
 - 25 - Ausformen der Pulpesuspension zu einer Bahn; und
 - Trocknen der Bahn zur Bildung von Papier.
- 30 12. Verfahren nach Anspruch 11, dadurch gekennzeichnet, daß der pH der Pulpesuspension auf einen bestimmten Wert zwischen 7 und 9 eingestellt wird, indem ein Überschuß des Alkalimetallhydroxids oder des Kohlendioxids zugegeben wird.

35 **Revendications**

1. Procédé pour stabiliser le pH d'une suspension de pâte à papier dans la préparation de matières de départ d'une machine à papier par utilisation de dioxyde de carbone, caractérisé par l'augmentation de la capacité tampon de ladite suspension de pâte à papier pour fabrication de papier par addition à celle-ci d'une combinaison d'une charge d'hydroxyde de métal alcalin et d'une charge de dioxyde de carbone, lesquelles charges neutralisent pratiquement l'effet de changement de pH l'une de l'autre, lesdites charges étant fournies en une quantité suffisante pour obtenir un effet tampon significatif de ladite suspension de pâte à papier, et par l'ajustement du pH de ladite suspension de pâte à papier par addition d'un excès dudit hydroxyde ou dudit dioxyde de carbone pour maintenir le pH à un niveau désiré pendant la totalité de la fabrication ultérieure du papier.
- 40 2. Procédé suivant la revendication 1, caractérisé en ce que le pH de ladite suspension de pâte à papier est ajusté à un pH compris entre environ 7 et 9 par addition d'un excès dudit hydroxyde de métal alcalin ou par addition d'un excès dudit dioxyde de carbone.
3. Procédé suivant la revendication 1, caractérisé en ce que ledit hydroxyde de métal alcalin est l'hydroxyde de sodium aqueux et ledit dioxyde de carbone est du dioxyde de carbone gazeux.
4. Procédé suivant la revendication 1, caractérisé en ce que ledit hydroxyde de métal alcalin est introduit dans ladite suspension de pâte à papier avant l'introduction dudit dioxyde de carbone.
- 55 5. Procédé suivant la revendication 1, caractérisé en ce que la capacité tampon de ladite suspension de pâte à papier est augmentée par la fourniture d'une quantité molaire pratiquement égale d'hydroxyde de métal alcalin et de dioxyde de carbone dissous, ladite quantité étant suffisante pour fournir un effet tampon significatif à environ pH 8.

6. Procédé suivant la revendication 1, caractérisé en ce que ladite suspension de pâte à papier est une pâte à papier chimique ou mécanique.
7. Procédé suivant la revendication 6, caractérisé en ce que ladite suspension de pâte à papier est une pâte à papier chimique blanchie.
8. Procédé suivant la revendication 1, caractérisé en ce que ladite suspension de pâte à papier contient et/ou est prévue pour contenir une charge de carbonate de calcium.
9. Procédé suivant la revendication 1, caractérisé en ce que lesdites charges d'hydroxyde de métal alcalin et de dioxyde de carbone sont ajoutées à ladite suspension de pâte à papier qui s'écoule dans une conduite conduisant à une cuve de préparation de matières de départ.
10. Procédé suivant la revendication 1, caractérisé en ce que ledit hydroxyde de métal alcalin et ledit dioxyde de carbone sont combinés avant introduction dans la suspension de pâte à papier.
11. Procédé pour la production de papier comprenant :
 - la fourniture d'une suspension de pâte à papier pour la fabrication de papier dans la préparation de matières de départ d'une machine à papier ;
 - l'augmentation de la capacité tampon de ladite suspension de pâte à papier par addition à celle-ci d'une combinaison d'une charge d'hydroxyde de métal alcalin et d'une charge de dioxyde de carbone, lesquelles charges neutralisent pratiquement les effets de changement de pH l'une de l'autre, lesdites charges étant fournies en une quantité suffisante pour obtenir un effet tampon substantiel de ladite suspension de pâte à papier, et ajustement du pH de ladite suspension de pâte à papier par addition d'un excès dudit hydroxyde ou dudit dioxyde de carbone pour maintenir le pH à un niveau désiré pendant la totalité de la fabrication ultérieure du papier ;
 - la mise de ladite suspension de pâte à papier sous forme de nappe ; et
 - le séchage de ladite nappe pour former du papier.
12. Procédé suivant la revendication 11, caractérisé en ce que le pH de ladite suspension de pâte à papier est ajusté à une valeur désirée comprise entre 7 et 9 par addition d'un excès dudit hydroxyde de métal alcalin ou dudit dioxyde de carbone.

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